DGCR8 is essential for microRNA biogenesis and silencing of embryonic stem cell self-renewal.

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Authors: Yangming Wang, Rostislav Medvid, Collin Melton, Rudolf Jaenisch, Robert Blelloch

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Public Summary:

Scientific Abstract:
The molecular controls that govern the differentiation of embryonic stem (ES) cells remain poorly understood. DGCR8 is an RNA-binding protein that assists the RNase III enzyme Drosha in the processing of microRNAs (miRNAs), a subclass of small RNAs. Here we study the role of miRNAs in ES cell differentiation by generating a Dgcr8 knockout model. Analysis of mouse knockout ES cells shows that DGCR8 is essential for biogenesis of miRNAs. On the induction of differentiation, DGCR8-deficient ES cells do not fully downregulate pluripotency markers and retain the ability to produce ES cell colonies; however, they do express some markers of differentiation. This phenotype differs from that reported for Dicer1 knockout cells, suggesting that Dicer has miRNA-independent roles in ES cell function. Our findings indicate that miRNAs function in the silencing of ES cell self-renewal that normally occurs with the induction of differentiation.